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IOT Base Energy Management System of Smart Grid Connections

Ashwini Bhaskar Dhiwar[1], Dr. Ganesh B. Dongre[2]

[1] CSMSS Chh.Shahu college of engineering kanchanwadi, Chh. Sambhajinagar
.[2] CSMSS Chh.Shahu college of engineering kanchanwadi, Chh. Sambhajinagar

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Abstract -Grid structure improvements are required due to the increasing demand for sustainable and renewable energy sources. The potential of an IOT-based smart grid to remotely monitor and manage renewable energy sources is investigated in this study. Here, we employ solar energy as a renewable energy source and leverage cloud computing to monitor and manage various loads. The main elements, features, and advantages of such a system are highlighted in the study. The advancement of smart grid technologies is driven by the growing need for sustainable energy solutions. Internet of Things (IOT)-enabled smart grid architecture for remote renewable energy source monitoring and control is proposed in this research. Integrating sensors with renewable energy sources, such as solar or wind turbines, is the fundamental idea. These sensors gather data in real time on system health, ambient conditions, and energy production. After that, this data is sent via a network to a cloud platform or central control system for additional analysis. Grid operators can increase overall grid stability and dependability, incorporate storage options for excess energy, and regulate energy production based on demand by adopting remote control capabilities. The benefits of this strategy, such as a lower carbon footprint, economic savings, and a more sustainable energy future, are outlined in the project's conclusion.

Key Words: IOT, Solar, Wind, MSEB, GSM, ESP32.

1. INTRODUCTION

Our everyday lives have been significantly impacted by electricity. Transmission and distribution systems link the generating station to the final consumer through an electrical grid-connected network. An electrical network that incorporates modern information and communication technology, such as linked devices, is called a smart grid. All network operators receive real-time data on electricity consumption and usage from a smart grid. Enhancing the sustainability, economic viability, and efficiency of energy generation, transmission, and distribution through the application of information and communication technology are the key components of a smart grid.

The cloud-based technology provides solar monitoring and determines whether there is an issue with the solar panel connection by reducing output using an IOT-based solar power monitoring system. The controller that keeps an eye on every solar panel parameter is the ESP32. Keep an eye on the solar panel and send data to the Internet of Things (IOT). Users are alerted to a problem with solar panel connections or dust on the panel as soon as an output drops below a predefined level. This allows you to keep an eye on the solar panel to make sure it's generating the most electricity possible.

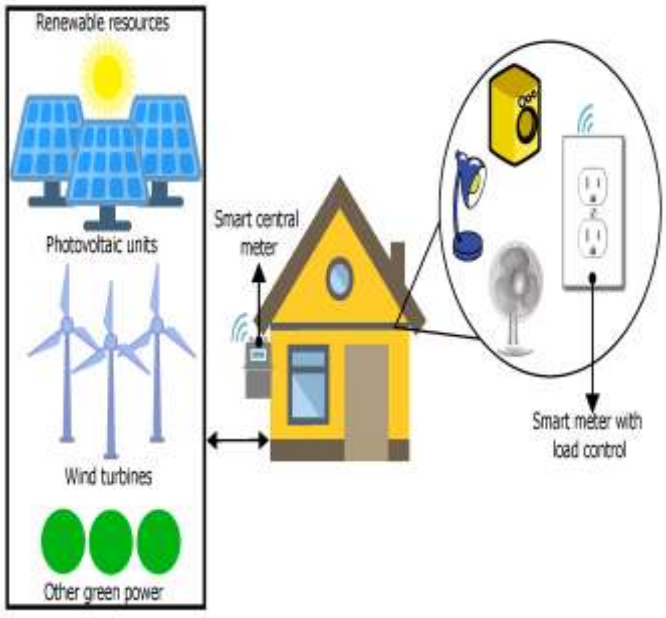

Fig. 1. A schematic diagram of traditional and future integrated energy systems

The Internet of Things, which is defined as "the Internet in which all the things are connected to each other," is a massive expansion of the Internet network. Workstations and data exchange technology

must be incorporated into the current electrical grid in order to implement the smart grid. The grid will function more effectively and dependably if digital technology, or IOT, is connected to it. It can also make advantage of solar power, which is more affordable and dependable than hydroelectric and wind power. Switches control the flow of information on the Internet, much like computer systems and communication devices like routers; smart-grid technologies employ statistics to maximize the efficient use of electricity.

Solution to the problem Real-time monitoring and control capabilities are provided by an IOT-based smart grid for the remote monitoring and management of renewable energy sources.

Enhanced performance, cost-effectiveness, energy optimization, and remote monitoring and control are among the advantages.

2. EXISTING SYSTEM

The current system in use is for cloud computing-based information exchange and solar monitoring. The Very Large Scale Integration (VLSI) methodology, Arduino, the Deer Hunting Organization Crow Search Algorithm (DHOCSA) approach, and other techniques can be used by researchers to remotely monitor and regulate renewable energy sources utilizing an IOT-based smart grid after 2021.

3. PROPOSED SYSTEM

This proposal suggests an IOT-based smart grid system for renewable energy sources. We use the ESP32 to transmit and receive data over Wi-Fi. We employ wind and solar energy as renewable energy sources in this project. Voltage is produced by the solar panel and transferred to a battery. We then employ a power supply in that rectifier. In order to facilitate communication between smart phones and hardware, we employ a variety of loads that are connected via the ESP32. On the other hand, we employ the cloud computing technique in the Think speak web server. We are able to monitor and manage every output of specified loads with the use of cloud computing.

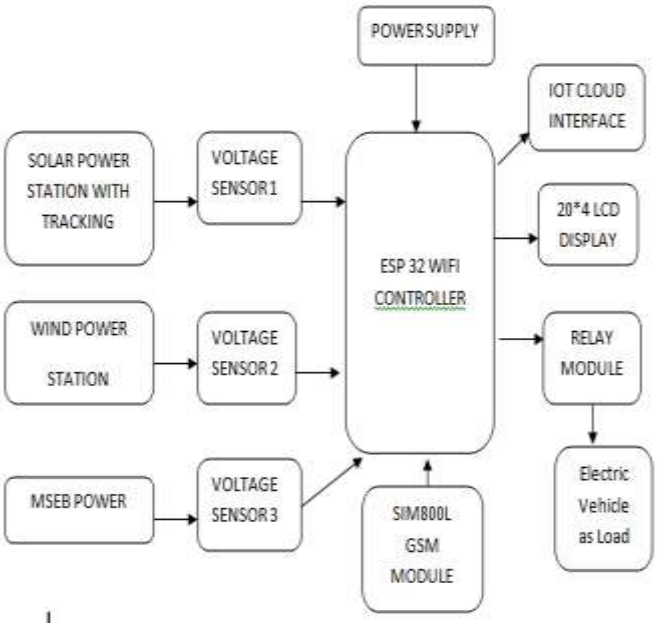

Fig. 2. Block Diagram Of Proposed System

The prototype model was put into practice and tested with success. An IOT-based smart grid can be a great way to monitor and manage renewable energy sources from a distance. It can gather information on energy production, use, and storage by integrating a variety of sensors and equipment. We monitor and manage various loads in our project by utilizing the Think Speak web server. Figures depict the output of various loads on the Think Speak web server, including lighting, gearbox line problems, and fans.

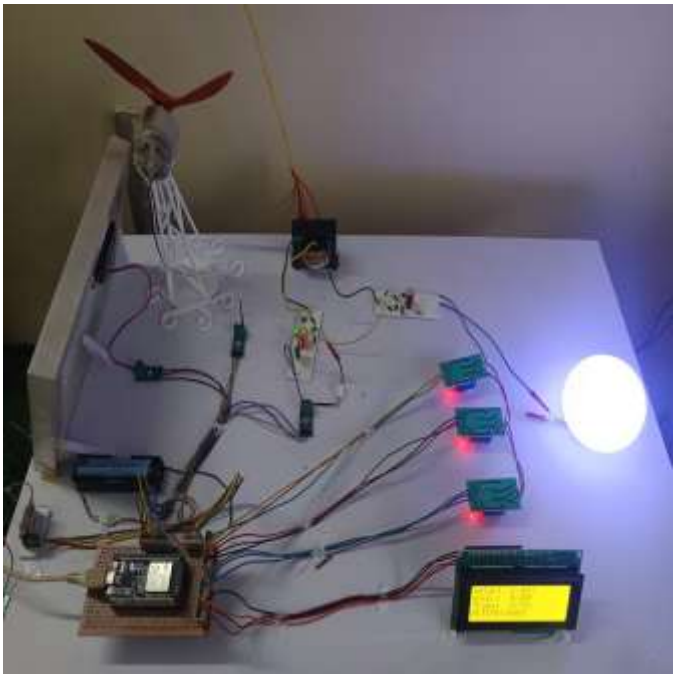

Fig -3: Hardware Of Proposed System

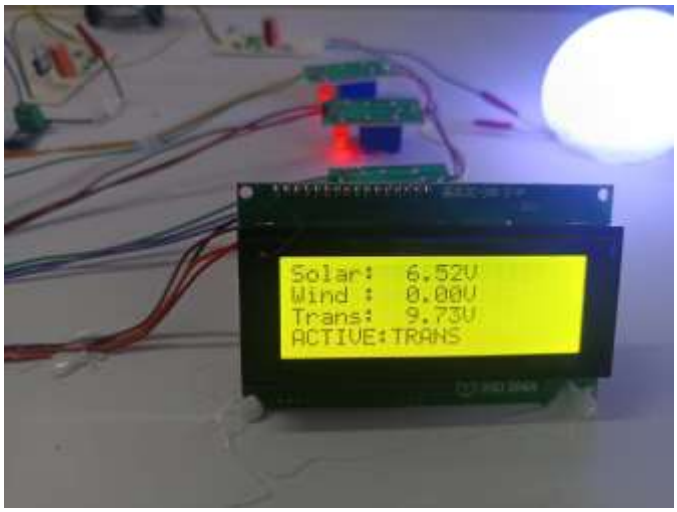

Fig -4: Real Time Data Is Shown On Display

As we can see in above figure, the real time data of solar, wind and mseb voltage is clearly seen on the lcd display respectively. Also as the supply voltage is increased according to threshold voltage the system shifted to the highest voltage provider which can be solar, wind voltage. As the both the voltages from solar and wind is less, the priority of system shifts on the mseb voltage

Fig -5: Real Time Data Is Shown Think speak Web Server

Fig -6: Real Time Data Is Shown Think speak Web Server

In above fig. real time data of solar, wind and mseb voltage are visible on think speak we server. Also is our system is active or not can be seen on this server. Following fig. shows the text message is received on user number when the system is shifted to the any of the available sources.

Fig -7: Real Time Data Is Received Via Text Message

The project's objective is to increase dependability and efficiency. It means that energy generation, consumption, and grid health may be monitored and optimized using real-time sensor data. This increases stability, lowers power loss, and detects maintenance needs early. The grid can more successfully integrate these sources if it has improved control and real-time data on the output of renewable energy. This makes it possible to store energy, control energy output in response to demand, and eventually advance a more sustainable energy infrastructure. "IOT-based smart grid for remote monitoring and management of renewable energy sources" Solar energy is a renewable energy source used in our project.

3. CONCLUSIONS

In summary, putting in place a "IOT-based smart grid to remotely monitor and control the renewable energy source" offers a potent means to maximize the usage of renewable energy and represents a major improvement in the way we manage our power

infrastructure. It encourages cost reduction, effective and dependable power delivery, and a major transition to a more sustainable energy future. The project may be easily customized to meet specific needs and is dependable. It offers highly effective ways to keep an eye on and manage our renewable (solar) energy resources, which would have otherwise been underutilized. Because using renewable energy sources will lower a carbon emission footprint, it is ultimately cost-effective and helps to minimize pollution. Lastly, it provides a very practical way to apply green energy methods on a bigger scale.

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